

## IMAGE SENSOR MODUL

### BACKGROUND OF THE INVENTION

#### Field of the invention

The present invention relates to an image sensor module, and more particularly to an image sensor module having a reduced manufacturing cost and package volume.

#### DESCRIPTION OF THE RELATED ART

Referring to FIG. 1, a conventional image sensor module includes a lens holder 10, a lens barrel 20, and an image sensor 30. The lens holder 10 has an upper face 12, a lower face 14 and an opening 16 penetrating through the lens holder 10 from the upper end face 12 to the lower end face 14. An internal thread 18 is formed on an inner wall of the opening 16 of the lens holder 10.

The lens barrel 20 formed with an external thread 22 is inserted from the upper end face 12 of the lens holder 10, received within the opening 16, and screwed to the internal thread 18 of the lens holder 10. The lens barrel 20 is formed with a transparent region 24 under which an aspheric lens 26 and an infrared filter 28 are arranged in sequence.

The image sensor 30 has a substrate 31, which is a printed circuit board. The substrate 31 has a first surface 32 formed with first connected points 34 and a second surface 33 opposite to the first surface 32 formed with second connected points 35.

The frame layer36 is arranged at the periphery of the first surface 32 of the substrate31.

The photosensitive chip37 is mounted on the first surface32 on which is electrically connected to the first connected points34 by wires38.

5        The transparent layer39 is adhered on the frame layer36 for covering the photosensitive chip37 and wires38.

The above-mentioned image sensor module has the following drawbacks.

1. Because the transparent layer 36 is bonded to the lower surface 14 of the lens holder 10 by the adhesive, which may contaminate the surface of the  
10 transparent layer 36, poor optical signals may be obtained.

2. When the module is assembled, the transparent layer 36 has to be precisely positioned with the aspheric lens 26 and then bonded to the lens barrel  
20. Once the positional precision deviates from the standard level, the overall module cannot be reassembled and has to be treated as waste material

15        3. The lens holder 10 has to be additionally provided to combine the lens barrel 20 with the image sensor 30.

4. The substrate 31 is a printed circuit board, which has a higher cost.

## SUMMARY OF THE INVENTION

It is an important subject of the present invention to provide an improved  
20 structure for an image sensor module, which is easy to be assembled/disassembled

and has less components.

It is another object of the present invention is to provide an image sensor module, which may be advantageously reduced the volume of the package.

It is still another object of the present invention is to provide an image  
5 sensor module, which may be omitted the printed circuit board and has a reduced manufacturing cost.

To achieve the above-mentioned object, the present invention of an image sensor module includes a substrate, a frame layer, a photosensitive chip, a transparent layer and a lens barrel. The substrate has plurality of lead frames, each  
10 of the lead frames has a first board and a second board located on a height different from that of the first board, the substrate is formed with an upper surface, which is formed with a opening, and a lower surface, which is formed with a cavity penetrated from the opening, each of the first board of the lead frames are exposed from the cavity, and each of the second board of the lead frames are  
15 exposed from the lower surface of the substrate. The frame layer is integrally formed with the substrate, and is arranged at the periphery of the upper surface of the substrate to define a chamber together with the substrate, an internal thread is formed on the inner wall of the chamber. The photosensitive chip is mounted within the cavity of the substrate, and is electrically coupled each of the first  
20 boards of the lead frames in a flip chip manner. The transparent layer is covered onto the upper surface of the substrate to cover the opening, therefore, the photosensitive chip may received optical signals passing through the transparent

layer. The lens barrel has a top surface, a bottom surface opposed to the top surface and a transparent region, an external thread is formed between the top surface and the bottom surface, the lens barrel is arranged within the chamber of the frame layer, the external thread being screwed on the internal thread of the chamber.

Furthermore, the present invention which is easy to be assembled/disassembled and has less components, then, it may be advantageously reduced the volume of the package and has less manufacturing cost

### **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a schematic illustration showing a conventional image sensor module.

FIG. 2 is exploded view showing an image sensor module of the present invention.

FIG. 3 is a cross-section showing an image sensor module of the present invention.

FIG. 4 is a second schematic illustration showing an image sensor module of the present invention

### **DETAILED DESCRIPTION OF THE INVENTION**

Please referring to FIG. 2 and FIG. 3, an image sensor module of the present invention includes a substrate<sup>42</sup>, a photosensitive<sup>44</sup>, a transparent layer<sup>46</sup>, a

molded resin47 and a lens barrel48.

The substrate42 has a plurality of lead frames50 arranged in a matrix, each of the lead frames50 have a first board60 and a second board62 located on a height different from that of the first board60, the substrate42 is forming with an upper surface52, which is formed with a opening58, and a lower surface54, which is formed with a cavity56 penetrated from the opening54, each of the first board60 of the lead frames50 are exposed from the cavity56 to define signal input terminals, and each of the second board62 of the lead frames50 are exposed from the lower surface54 of the substrate40 to define signal output terminals, wherein a third board 64 is coupled the first board64 to the second board62.

The frame layer42 is integrally formed with the substrate40 by way of injecting mold, and is arranged at the periphery of the upper surface52 of the substrate40 to define a chamber66 together with the substrate40, an internal thread 68 is formed on the inner wall of the chamber66.

The photosensitive chip44 is arranged within the cavity 56 and electrically connected to the first board60 of the lead frame50 in a flip chip manner.

The transparent layer46 is a piece of glass adhered onto the upper surface52 of the substrate40 to cover the opening58, therefore, the photosensitive chip44 may received optical signals passing through the transparent layer46.

The molded resin47 is filled into the cavity56 of the substrate40 for covering the photosensitive chip44.

The lens barrel48 has an upper end face 70, a bottom end face72 opposed to the upper end face 70 and a transparent region76. A external thread74 is formed between the upper end face 70 and the bottom end face72. The lens barrel48 is arranged within the chamber66 of the frame layer42, the external thread74 of the lens barrel48 is screwed on the internal thread68 of the chamber66. A through hole78 communication with the transparent region76 is formed at the upper end face70 of the lens barrel48, and an aspheric lens80 and an infrared filter82 under the aspheric lens80 is arranged within the transparent region76 of the lens barrel48.

Please referring toFIG.4, which is a second schematic illustration showing an image sensor module of the present invention, wherein the transparent layer46 and the infrared filter82 are combined, therefore, the transparent layer46 may be omitted.

To sum up, the present invent has the following advantages.

1. Since the frame layer42 and the lens barrel48 are screwed together through the external thread74 and internal thread68, the module is easy to be assembled / disassembled so as to facilitate the replacement of the components and the source recycling.
2. Since the conventional lens holder is omitted, the product size may be reduced.
3. Since the substrate40 and the frame layer42 are integrally formed by injecting mold, and an internal thread68 is formed on the frame layer42, therefore, the

module may be omitted.

4. Since the substrate<sup>40</sup> is consist of a plurality of lead frames<sup>30</sup> so as to may reduced the manufacturing cost.

5 While present the invention has been described by way of an example and in terms of a preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiment. To the contrary, it is intended to cover various modifications. Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications.